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A CHECKLIST OF THE FISHES OF GROOTE EYLANDT,

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Abstract

The fish species recorded in the inshore waters of Groote Eylandt during a CSIRO survey in 1989 and 1990 are listed. In all, 179 species were recorded, of which 135 occurred in seagrass beds. The list is compared with that of the American–Australian Expedition of 1948. This expedition collected 126 species, 67 of which were also recorded by the CSIRO study. Those not caught in 1989–90 were mainly from freshwater or coral reefs—habitats not sampled by the CSIRO study.

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Introduction

Groote Eylandt is a continental island some 50 x 50 km in size at latitude 14°S and longitude 136°E in the north-west Gulf of Carpentaria. It is an Aboriginal Reserve, but large-scale opencast mining of manganese is carried out. Various aspects of its natural history have received attention, particularly the botany and geology (Langkamp et al., 1981; McIntosh et al., 1975). The fauna, including fish, birds, reptiles and mammals was surveyed by the American–Australian Scientific Expedition to Arnhem Land in 1948 (Deignan, 1964; Mountford, 1964; Taylor, 1964). The shelf waters around Groote Eylandt are important commercial fishing grounds for penaeid prawns, particularly *Penaeus semisulcatus* and *Penaeus esculentus*. The seagrass beds of its inshore waters are the nursery grounds for these prawn species (Somers et al., 1987).

During 1989 and 1990 CSIRO Division of Fisheries studied the fish fauna of the inshore waters of Groote Eylandt. The primary objective of this work was to quantitatively describe the fishes and their role as predators of prawns in seagrass beds (Blaber et al., 1992; Brewer et al., 1992). A variety of nearshore non-estuarine seagrass and non-seagrass habitats were sampled. This paper gives a complete list of all species recorded during the investigation. The only previous comprehensive data on the fishes of Arnhem Land are in the records of the American–Australian Expedition (Taylor, 1964); those pertaining to Groote Eylandt have been extracted here for comparison with our checklist.

Study areas

Sampling sites are shown in Figure 1. Three localities were chosen: in sheltered Northwest Bay, in the less sheltered Bartalumba Bay and on the exposed west coast. Details of the species of seagrass and water depth at each site are given in Blaber et al. (1992). Collections were made in tall dense seagrasses, short sparse seagrasses, mixed species seagrass beds, and in non-vegetated areas. The maximum depth sampled was 7 m. Also shown in Figure 1 are the collecting sites of the American–Australian Expedition in 1948 (Taylor, 1964).

Materials and methods

Sampling took place over 2 to 3 weeks in January (wet season), May (late wet/early dry season), August (dry season) and December (late dry/early wet season) 1989, and February (wet season), May, August and October/November (late dry season) 1990.

Fish were captured with monofilament gill nets (1310.25 h of sampling), a large bagseine net (60 m x 2 m) (33 hauls), a 260 m stake net (5 operations) and with the piscicide 'rotenone' (17 operations). In addition a small amount of trolling took place in open waters. Further details of sampling equipment and methods are given in Blaber et al. (1992).

The American–Australian Expedition of 1948 used the following methods: a small bagseine net (7.5 m long), hook and line, poisoning and retrieval with dip nets (derris and barbasco root poisons), spearing and trolling. All collections were made between 8 April and 31 July 1948.

Species identifications

Species were identified as far as possible using specialist keys. Where any doubt existed, specimens were forwarded to the relevant taxonomic authorities. The names used in the checklist were taken mainly from Smith and Heemstra (1986) and Paxton et al. (1989).

Checklist of species

A total of 179 species were recorded, of which 135 species occurred in seagrass beds (Table 1). Details of the distribution of the more abundant species are given in Blaber et al. (1992). Only 67 of the 126 species (53%) collected by the American–Australian Expedition (Taylor, 1964) were recorded in 1989–90. Those not recorded are listed in Table 2 (the original published names have been updated to conform with current taxonomy) together with the habitat type from which they were caught in 1948. Twelve of the American–Australian Expedition species were from freshwater, 4 from estuarine areas and 26 were strongly associated with coral reefs. None of these three habitats was sampled by CSIRO. The absence of some of the more important food fish species, such as *Lutjanus malabaricus* and *L. sebae*, from the CSIRO survey is significant and may perhaps reflect the impact of local fishing of this resource.

Acknowledgements

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References

- Blaber, S. J. M., Brewer, D. T., Salini, J. P., Kerr, J. and Conacher, C. (1992). Species composition and biomasses of fishes in tropical seagrasses at Groote Eylandt, northern Australia. *Estuarine, Coastal and Shelf Science* (in press).
- Brewer, D. T., Blaber, S. J. M. and Salini, J. P. (1992). Predation on penaeid prawns by fishes in different seagrass habitats at Groote Eylandt, Gulf of Carpentaria, Australia. (in prep.)
- Deignan, H. C. (1964). Birds of the Arnhem Land Expedition. Records of the American–Australian Scientific Expedition to Arnhem Land 5, 345–425.
- Langkamp, P. J., Ashton, D. H. and Dalling, M. J. (1981). Ecological gradients in forest communities on Groote Eylandt, Northern Territory, Australia. *Vegetatio* 48, 27–46.
- McIntosh, J. L., Farag, J. S. and Slee, K. J. (1975). Groote Eylandt manganese deposits, pp. 815–821, in: *Economic geology of Australia and Papua New Guinea* (ed. C. L. Knight). Australian Institute of Minerals and Metallurgy, Monograph 5.
- Mountford, C. P. (1964). Records of the American–Australian Expedition to Arnhem Land. Melbourne University Press, Melbourne.

Paxton, J. R., Hoese, D. F., Allen, G. R., and Hanley J. E. (1989). Zoological Catalogue of Australia. Volume 7: Pisces. Australian Government Publishing Service, Canberra.

Smith, M. M. and Heemstra, P. C. (1986). Smith's Sea Fishes. Macmillan, Johannesburg, South Africa.

Somers, I. F., Crocos, P. J. and Hill, B. J. (1987). Distribution and abundance of the tiger prawns *Penaeus esculentus* and *P. semisulcatus* in the north-western Gulf of Carpentaria, Australia. *Australian Journal of Marine and Freshwater Research* 38, 63–78.

Taylor, W. R. (1964). Fishes of Arnhem Land, pp. 45–307 in Records of the American–Australian Scientific Expedition to Arnhem Land 4, Melbourne University Press, Melbourne.

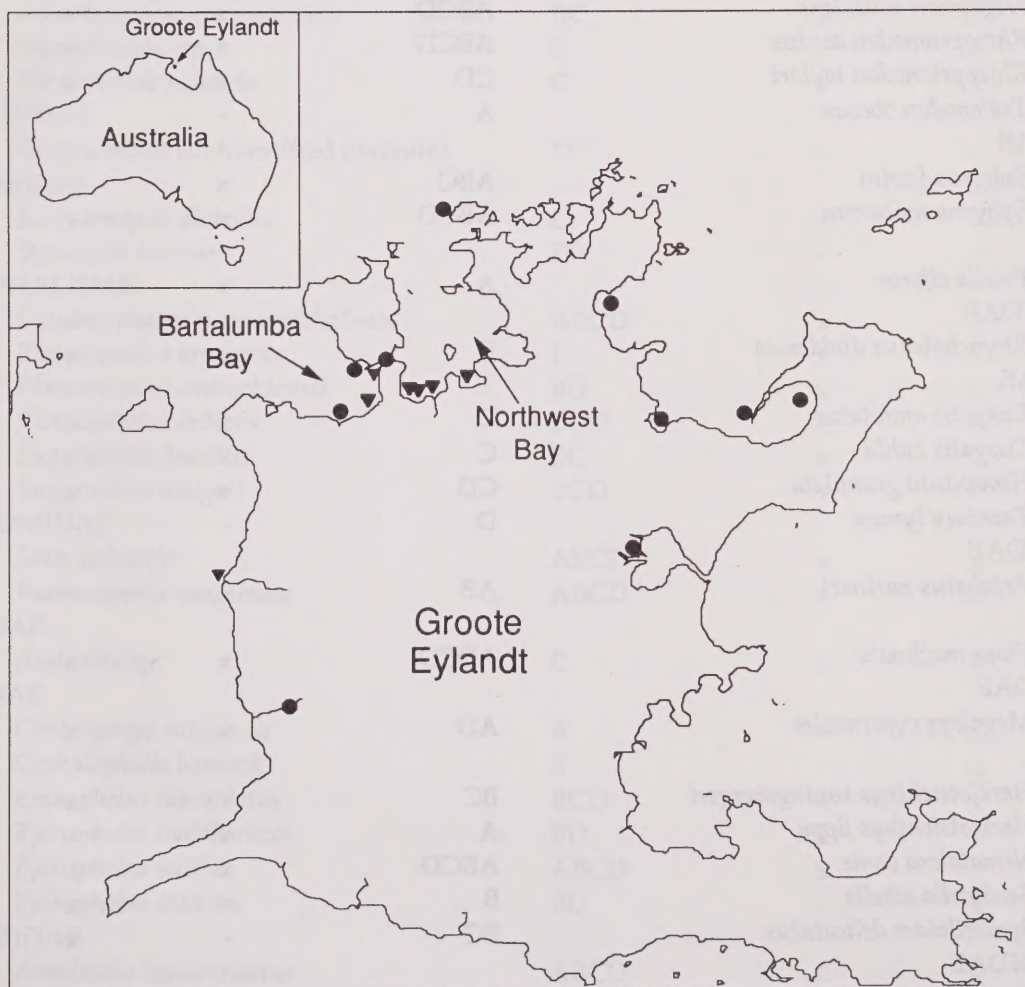


Figure 1. Map of Groote Eylandt showing 1989–90 sample sites (▼) and locations of 1948 collections (●).

Table 1. Species collected in the different seasons (A = wet, B = late wet/early dry, C = dry, D = late dry/early wet) from Groote Island from 1989 to 1990 and whether present in seagrass beds or recorded during 1948 (x = present, - = absent)

FAMILY	Species	Season	Seagrass	1948
ORECTOLOBIDAE				
	<i>Chiloscyllium punctatum</i>	ABCD	x	-
	<i>Hemiscyllium trispeculare</i>	B	x	-
	<i>Nebrius concolor</i>	ABCD	x	-
CARCHARHINIDAE				
	<i>Carcharhinus amblyrhynchoides</i>	ABCD	x	-
	<i>Carcharhinus amblyrhynchos</i>	ABCD	x	-
	<i>Carcharhinus cautus</i>	ABCD	x	-
	<i>Carcharhinus dussumieri</i>	ABCD	x	-
	<i>Carcharhinus fitzroyensis</i>	AD	-	-
	<i>Carcharhinus limbatus</i>	ABCD	x	-
	<i>Carcharhinus melanopterus</i>	ABCD	x	-
	<i>Carcharhinus sorrah</i>	ABCD	x	-
	<i>Galeocerda cuvier</i>	D	-	-
	<i>Hemigaleus microstoma</i>	C	-	-
	<i>Hemipristis elongatus</i>	C	x	-
	<i>Negaprion acutidens</i>	ABCD	x	-
	<i>Rhizoprionodon acutus</i>	ABCD	x	x
	<i>Rhizoprionodon taylori</i>	CD	x	x
	<i>Triaenodon obesus</i>	A	-	-
SPHYRNIDAE				
	<i>Sphyrna lewini</i>	ABC	x	-
	<i>Sphyrna mokarran</i>	ABCD	x	-
PRISTIDAE				
	<i>Pristis zijsron</i>	A	x	-
RHINOBATIDAE				
	<i>Rhynchobatus djiddensis</i>	B	-	-
DASYATIDAE				
	<i>Dasyatis annotatus</i>	D	x	-
	<i>Dasyatis kuhlii</i>	C	x	-
	<i>Himantura granulata</i>	CD	x	-
	<i>Taeniura lymna</i>	D	-	-
MYLIOBATIDAE				
	<i>Aetobatus narinari</i>	AB	-	-
ELOPIDAE				
	<i>Elops machnata</i>	ABCD	x	x
MEGALOPIDAE				
	<i>Megalops cyprinoides</i>	AD	x	x
CLUPEIDAE				
	<i>Herklotsichthys koningsbergeri</i>	BC	-	x
	<i>Herklotsichthys lippa</i>	A	x	-
	<i>Nematalosa come</i>	ABCD	x	-
	<i>Sardinella albella</i>	B	x	x
	<i>Spratelloides delicatulus</i>	BC	-	x
ENGRAULIDIDAE				
	<i>Stolephorus carpentariae</i>	C	x	-
	<i>Stolephorus</i> sp.	B	x	-
	<i>Thryssa hamiltoni</i>	ABCD	x	x

CHIROCENTRIDAE				
<i>Chirocentrus dorab</i>	ABCD	x	-	
CHANIDAE				
<i>Chanos chanos</i>	ABCD	x	-	
ARIIDAE				
<i>Arius macrocephalus</i>	ABD	x	-	
<i>Arius proximus</i>	ABCD	x	-	
HEMIRAMPHIDAE				
<i>Arrhamphus sclerolepis</i>	ABCD	x	x	
<i>Hemiramphus far</i>	ABCD	x	x	
<i>Hemirhamphus robustus</i>	C	x	-	
<i>Hyporhamphus quoyi</i>	ABCD	x	x	
<i>Zenarchopterus buffonis</i>	B	x	-	
<i>Zenarchopterus dispar</i>	D	x	-	
BELONIDAE				
<i>Ablennes hians</i>	C	-	-	
<i>Lhotskia gavioloides</i>	C	-	x	
<i>Strongylura incisa</i>	ABCD	x	x	
<i>Strongylura strongylura</i>	AC	x	-	
<i>Tylosurus acus</i>	C	-	-	
<i>Tylosurus crocodilus</i>	ABCD	x	x	
<i>Tylosurus punctulatus</i>	ABCD	x	-	
ATHERINIDAE				
<i>Atherinomorus endrachtensis</i>	BC	x	x	
<i>Hypoatherina</i> sp.	C	-	-	
<i>Stenatherina panatela</i>	C	-	x	
SYNGNATHIDAE				
<i>Syngnathidae</i> (unidentified juvenile)	D	-	-	
SCORPAENIDAE				
<i>Scorpaenopsis diabolus</i>	C	-	-	
<i>Synanceja horrida</i>	D	-	x	
PLATYCEPHALIDAE				
<i>Cymbacephalus nematophthalmus</i>	ABCD	x	x	
<i>Platycephalus arenarius</i>	D	x	-	
<i>Platycephalus endrachtensis</i>	BD	x	x	
<i>Platycephalus indicus</i>	BCD	x	-	
<i>Suggrundus bosschei</i>	BC	x	x	
<i>Suggrundus staigeri</i>	BCD	x	-	
CENTROPOMIDAE				
<i>Lates calcarifer</i>	ABCD	x	x	
<i>Psammoperca waigiensis</i>	ABCD	x	x	
AMBASSIDAE				
<i>Ambassis</i> sp.	C	x	-	
SERRANIDAE				
<i>Centrogenys vaigiensis</i>	B	-	x	
<i>Cephalopholis boenack</i>	B	-	x	
<i>Epinephelus lanceolatus</i>	BCD	x	x	
<i>Epinephelus malabaricus</i>	BD	x	-	
<i>Epinephelus suillus</i>	ABCD	x	-	
<i>Epinephelus tauvina</i>	BD	-	x	
TERAPONTIDAE				
<i>Amniataba caudavittatus</i>	ABCD	x	x	
<i>Pelates quadrilineatus</i>	ABCD	x	-	
<i>Pelates sexlineatus</i>	AB	x	-	
<i>Terapon jarbua</i>	ABC	x	x	
<i>Terapon puta</i>	B	x	-	

APOGONIDAE			
<i>Apogon ruppelli</i>	B	x	-
SILLAGINIDAE			
<i>Sillago analis</i>	BCD	x	x
<i>Sillago maculata</i>	ABCD	x	x
RACHYCENTRIDAE			
<i>Rachycentron canadus</i>	ACD	x	-
ECHENEIDIDAE			
<i>Echeneis naucrates</i>	BCD	x	x
CARANGIDAE			
<i>Absalom radiatus</i>	ABD	-	-
<i>Alectis indicus</i>	A	-	x
<i>Carangoides fulvoguttatus</i>	C	-	-
<i>Carangoides hedlandensis</i>	C	-	-
<i>Carangoides humerosus</i>	C	x	-
<i>Caranx bucculentus</i>	ABCD	-	x
<i>Caranx ignobilis</i>	ACD	x	-
<i>Caranx papuensis</i>	ABC	x	-
<i>Caranx sexfasciatus</i>	A	x	x
<i>Gnathanodon speciosus</i>	ABCD	x	x
<i>Scomberoides commersonianus</i>	ABCD	x	-
<i>Scomberoides lysan</i>	BD	x	x
<i>Scomberoides tala</i>	ABCD	x	x
<i>Scomberoides tol</i>	ACD	x	x
<i>Selaroides leptolepis</i>	B	x	-
FORMIONIDAE			
<i>Apolectus niger</i>	A	-	-
LEIOGNATHIDAE			
<i>Gazza minuta</i>	BC	x	x
<i>Leiognathus decorus</i>	A	x	-
<i>Leiognathus equulus</i>	ABCD	x	x
<i>Leiognathus fasciatus</i>	A	-	-
<i>Leiognathus splendens</i>	A	x	x
POMACANTHIDAE			
<i>Pomacanthidae</i> (unidentified juv)	B	-	-
LUTJANIDAE			
<i>Lutjanus argentimaculatus</i>	ABD	x	x
<i>Lutjanus carponotatus</i>	ABCD	x	x
<i>Lutjanus russelli</i>	ABCD	x	x
CAESIONIDAE			
<i>Caesio cuning</i>	A	-	-
NEMIPTERIDAE			
<i>Scolopsis milii</i>	ABCD	x	x
GERREIDAE			
<i>Gerres abbreviatus</i>	ABCD	x	x
<i>Gerres argyreus</i>	CD	x	-
<i>Gerres filamentosus</i>	C	x	x
<i>Gerres oyena</i>	ABCD	x	x
HAEMULIDAE			
<i>Diagramma pictum</i>	ABCD	x	-
<i>Plectorhynchus flavomaculatus</i>	ABCD	x	-
<i>Plectorhynchus gibbosus</i>	ABC	x	x
<i>Plectorhynchus polytaenia</i>	BC	x	x
<i>Pomadasys argenteus</i>	ABC	-	-
<i>Pomadasys kaakan</i>	ABCD	x	-

LETHRINIDAE				
	<i>Lethrinus fraenatus</i>	ABCD	x	x
	<i>Lethrinus lentjan</i>	ABCD	x	-
	<i>Lethrinus nebulosus</i>	D	x	-
SPARIDAE				
	<i>Acanthopagrus berda</i>	BC	x	x
	<i>Mylio latus</i>	CD	x	x
MULLIDAE				
	<i>Upeneus tragula</i>	ABCD	x	-
MONODACTYLIDAE				
	<i>Monodactylus argenteus</i>	AB	-	x
EPHIPPIDIDAE				
	<i>Drepane punctata</i>	A	-	-
	<i>Platax bataviensis</i>	AB	x	x
	<i>Zabidius novemaculatus</i>	ACD	x	-
SCATOPHAGIDAE				
	<i>Selenotoca multifasciata</i>	B	x	x
CHAETODONTIDAE				
	<i>Parachaetodon ocellatus</i>	A	-	-
POMACENTRIDAE				
	<i>Abudefduf bengalensis</i>	D	-	x
MUGILIDAE				
	<i>Liza subviridis</i>	ABCD	x	x
	<i>Liza vaigiensis</i>	ABD	x	x
	<i>Valamugil buchanani</i>	ABCD	x	x
	<i>Valamugil cunnesius</i>	AD	x	x
SPHYRAENIDAE				
	<i>Sphyræna barracuda</i>	ABD	x	x
	<i>Sphyræna jello</i>	CD	x	-
	<i>Sphyræna putnamiae</i>	ABCD	x	-
	<i>Sphyræna genie</i>	ABD	x	-
POLYNEMIDAE				
	<i>Eleutheronema tetradactylum</i>	ACD	-	-
LABRIDAE				
	<i>Choerodon cephalotes</i>	C	-	-
	<i>Choerodon cyanodus</i>	BCD	x	-
	<i>Choerodon schoenleinii</i>	ABC	x	-
SCARIDAE				
	<i>Scarus ghobban</i>	ABCD	x	-
CONGROGADIDAE				
	<i>Congrogadus subducens</i>	D	-	x
BLENNIIDAE				
	<i>Omobranchus rotundiceps</i>	D	-	-
GOBIIDAE				
	<i>Acentrogobius caninus</i>	B	x	-
	<i>Amblygobius bynoensis</i>	B	x	-
	<i>Bathygobius fuscus</i>	D	-	-
	<i>Drombus globiceps</i>	D	-	-
	<i>Drombus ocyurus</i>	C	-	-
	<i>Drombus triangularis</i>	BD	x	-
	<i>Favonigobius melanobranchus</i>	BCD	x	-
	<i>Mugilogobius</i> sp.14	D	-	-
	<i>Pseudogobius</i> sp.	CD	x	-
	<i>Yongeichthys nebulosus</i>	BD	x	-
ELEOTRIDAE				
	<i>Butis butis</i>	B	x	-

SIGANIDAE

Siganus canaliculatus

Siganus chrysospilos

Siganus fuscus

Siganus javus

Siganus lineatus

Siganus puellus

Siganus virgatus

SCOMBRIDAE

Scomberomorus queenslandicus

Scomberomorus commerson

Scomberomorus semifasciatus

Thunnus tonggol

BOTHIDAE

Pseudorhombus elevatus

CYNOGLOSSIDAE

Cynoglossus maculipinnis

TRIACANTHODIDAE

Triphichthys weberi

MONACANTHIDAE

Acreichthys tomentosus

Monacanthus chinensis

TETRAODONTIDAE

Chelonodon patoca

Torquigener whitleyi

Table 2. Species collected by the American-Australian Expedition to Arnhem Land in 1948 that were not recorded by CSIRO in 1989 and 1990.

FAMILY	Species	Habitat collected
RHINOBATIDAE	<i>Rhinobatos batillum</i>	estuary
ENGRAULIDIDAE	<i>Stolephorus indicus</i>	open water
ARIIDAE	<i>Arius thalassinus</i>	inshore
PLOTOSIDAE	<i>Paraplotosus albilabris</i>	reef
	<i>Neosilurus ater</i>	freshwater
	<i>Neosilurus rendahli</i>	freshwater
OPHICHTHIIDAE	<i>Ophichthus</i> sp.	freshwater
HEMIRAMPHIDAE	<i>Hyporhamphus regularis</i>	open water
	<i>Zenarchopterus gilli</i>	freshwater
ATHERINIDAE	<i>Allanetta mugiloides</i>	inshore
	<i>Craterocephalus pauciradiatus</i>	inshore
	<i>Atherinomorus lacunosus</i>	inshore
SYNGNATHIDAE	<i>Choeroichthys brachysoma</i>	reef
SCORPAENIDAE	<i>Scorpaena picta</i>	reef
MELANOTAENIIDAE	<i>Melanotaenia nigrans</i>	freshwater
	<i>Melanotaenia splendida</i>	freshwater
	<i>Pseudomugil gertrudae</i>	freshwater
AMBASSIDAE	<i>Ambassis agrammus</i>	freshwater
	<i>Ambassis vachellii</i>	freshwater
	<i>Denarius bandata</i>	freshwater
PSEUDOCHROMIDAE	<i>Pseudochromis punctatus</i>	offshore (>7 m)
GRAMMISTIDAE	<i>Diploprion bifasciatum</i>	inshore
SERRANIDAE	<i>Epinephelus fasciatus</i>	reef
	<i>Epinephelus quoyi</i>	reef
	<i>Epinephelus corallicola</i>	reef
APOGONIDAE	<i>Fowleria aurita</i>	reef
	<i>Apogon timorensis</i>	reef
	<i>Apogon cookii</i>	reef
	<i>Apogon angustatus</i>	reef
	<i>Apogon hyalosoma</i>	freshwater
	<i>Glossamia aprion</i>	freshwater

CARANGIDAE	Trachinotus bailloni	inshore
	Selar boops	inshore
	Selar crumenophthalmus	inshore
	Carangoides chrysophrys	estuary
LEIOGNATHIDAE	Secutor ruconius	estuary
LUTJANIDAE	Lutjanus fulviflamma	reef
	Lutjanus erythropterus	inshore
	Lutjanus malabaricus	reef
	Lutjanus sebae	inshore
GERREIDAE	Gerres subfasciatus	inshore
SCIAENIDAE	Protonibea diacanthus	inshore
EPHIPPIDIDAE	Platax orbicularis	inshore
SCATOPHAGIDAE	Scatophagus argus	inshore
CHAETODONTIDAE	Chelmon rostratus	reef
POMACENTRIDAE	Abudefduf sordidus	reef
	Pomacentrus littoralis	reef
	Amphiprion bicinctus	reef
	Amphiprion polymnus	reef
	Amphiprion percula	reef
SPHYRAENIDAE	Sphyraena chrysotaenia	inshore
SCARIDAE	Scarus rubroviolaceus	reef
	Scarus rivulatus	reef
ACANTHURIDAE	Acanthurus grammoptilus	reef
NOTOGRAPTIDAE	Notograptus guttatus	reef
BOTHIDAE	Pseudorhombus arsius	estuary
BATRACHOIDIDAE	Halophryne diemensis	reef
ANTENNARIIDAE	Tathicarpus butleri	reef

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